American Journal of Pharmacy

AND THE SCIENCES SUPPORTING PUBLIC HEALTH

DR. GEORGE URDANG
1882 - 1960

Since 1825 *July 1960*

American Journal of Pharmacy

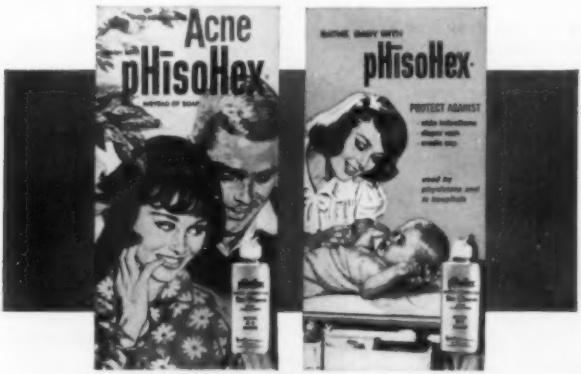
Published monthly by the Philadelphia College of Pharmacy and Science
43d Street, Kingsessing and Woodland Avenues, Philadelphia 4, Pa.

Annual Subscription $4.00 — Foreign Postage, 25 Cents Extra
Single Numbers, 40 Cents — Back Numbers, 50 Cents

Second Class Postage Paid at Philadelphia, Pa.

Keep the pHisoHex® success story before your customers— get your new full-color counter/window displays

The pHisoHex success story is spread every day by physicians and satisfied customers and in hospitals. This story means ever-increasing sales for you. ■ Use of pHisoHex by teen-agers will enhance any treatment for acne. pHisoHex, the antiseptic detergent, protects baby's skin against infections and helps to guard his health. pHisoHex, containing 3 per cent hexachlorophene, is nonalkaline, nonirritating and hypoallergenic. It is supplied in 5 oz. plastic squeeze bottles and in bottles of 16 oz. and 1 gal.



Ask your Winthrop representative for the two complimentary full-color 18½ by 9½ counter/window displays, and keep customers constantly aware of pHisoHex.

Winthrop LABORATORIES
1450 Broadway
New York 18, N. Y.

AMERICAN JOURNAL OF PHARMACY

AND THE SCIENCES SUPPORTING PUBLIC HEALTH

Since 1825

Vol. 132 JULY 1960 No. 7

CONTENTS

IN MEMORIAM

DR. GEORGE URDANG

GEORGE URDANG died Monday, June 27, 1960, in Madison, Wisconsin at age 78, after a career that had earned him international recognition as one of the greatest pharmacist-scholars ever to devote his talent to the study and writing of pharmacy's history. He reached retirement age eight years ago at the University of Wisconsin where he was the first full professor in the history of pharmacy. Since then, his professional activities had been progressively curtailed by Parkinsonism. Three years ago, he also retired as Director of the American Institute of the History of Pharmacy.

Born at Tilsit, Germany (June 13, 1882), Dr. Urdang had been in the United States since 1938. Educated as a pharmacist at the University of Leipzig, he practiced pharmacy for nine years in Rosenberg, West Prussia. At this time, his contributions to journals of pharmacy and other publications had already made him widely known. In 1919, he was appointed editor of the well-known German journal, the *Pharmazeutische Zeitung*, a position he held until the political uproar in Nazi Germany forced his resignation.

Meanwhile, Urdang had taken up advanced historical and social studies at the Universities of Berlin and Halle-Wittenberg and earned the degree of Doctor of Natural Science "with distinction." He was the first in Germany to receive such a degree on the basis of a historical thesis with pharmacy as a major. He also was the only one to receive his degree under the world-famous historian of science, E. von Lippmann.

In 1926, Urdang founded, together with four friends, the German Society for the History of Pharmacy, which he served as director until 1934. After World War II, the Society made Urdang an honorary member and awarded him the Schelenz Plaque in 1949, the same year in which he received the Urban Medal and the Günther Schmid Medal. Here in America, he received an honorary Doctor of

Science degree from the Philadelphia College of Pharmacy and Science (1946); he was selected for the J. Leon Lascoff Award (1951) by the American College of Apothecaries; and he had been an honorary member of the American Pharmaceutical Association since 1932. Honorary or corresponding memberships were accorded him by a variety of organizations in various parts of the world.

After arriving in the United States in 1938, Urdang took special studies to become licensed in America as a pharmacist; then, accepted an invitation from Professor Edward Kremers at the University of Wisconsin to join him in writing the volume, "History of Pharmacy," which subsequently became a standard reference and textbook in the field.

Under the influence of Urdang, and based upon his experience in the German Society, an American Institute of the History of Pharmacy was founded in 1941, with headquarters in Madison and with Urdang as its first Director, a position he held until 1957. During his administration, the Institute became one of the most productive and best-known specialized historical societies of its kind in the world.

In 1947, the University of Wisconsin created a chair for the history of pharmacy, with Urdang as the first occupant. Until he reached retirement age (1952) at the University, Urdang gave pharmacy students, through his teaching, a strong sense of their professional heritage and a keen awareness of their place in society and the health field, according to faculty colleagues. He educated the first three men ever to obtain the Doctor of Philosophy degree in the United States on the basis of historical studies and research in the pharmaceutical field; and he helped to give recognition and leadership to a type of scholarship in the sciences and scientific professions that has since made the History of Science Department at the University of Wisconsin one of the outstanding centers of its kind internationally, according to historians.

Urdang wrote a number of books and scores of articles that reveal and interpret many historical developments and contributions in the field of pharmacy. His conviction that "sense finding must follow fact finding" and that every student and every human being needs to be recognized and encouraged for whatever merit he has were firmly held ideas that gave him affection as well as respect from students and colleagues alike.

E D I T O R I A L

AN EXAMPLE FOR OTHERS

THE action taken by the Pennsylvania Pharmaceutical Association at its recent convention in Pittsburgh is an example which other states should follow. The Association gave formal approval to the principle of a vertically integrated organization for pharmacy from the county to the state and national level and authorized its Executive Committee to contact the Council of the American Pharmaceutical be accomplished. We understand that a few other states have made similar proposals. This action might well be the turning point for a vastly improved professional organization of pharmacy in the United States and one which we may add is long overdue.

We have said it before and we say it again—the voice of pharmacy is that of a multitude and usually with such confusion that it is not surprising that, in its disorganization and chaos, it is rarely listened to and even more rarely effective. It is frequently embarrassing for officers of state associations to hear spokesmen for pharmacy at the county level expound proposals or speak authoritatively for pharmacy at the local level in terms which are diametrically opposed to the official and stated position of the state association. It is equally unfortunate and harmful to our professional goals when state associations themselves do almost precisely the same thing at times insofar as the position of the American Pharmaceutical Association is concerned. Our lack of integrated structure is also the primary cause for poor membership on the part of pharmacists in their pharmaceutical organizations—be they county, state, or national—and, without a full and responsible membership, the profession can scarcely hope to get proper recognition and attention in its efforts to serve the best interests of public health.

In working toward a better integration in our organizations, what is being proposed is not a dictatorship from the top but improved coordination and communication in both directions with every pharmacist in America a member of his county, state, and national professional organization and a full understanding of the goals which the

profession must seek. It is fully expected that each county organization will serve as a grass roots organization feeding ideas and suggestions through the state organization and eventually to the American Pharmaceutical Association. It is also imperative that there be an improvement in communications from the national level to the local level so that every pharmacist will understand the programs in which he is expected to play such an essential part.

It is to be expected that there will be some at the county and state level who will view with both disapproval and dismay any thought of bringing state and local pharmaceutical organizations into a close working agreement with the American Pharmaceutical Association. Those who are so minded should consider very carefully whether it is not better that these organizations lose some little of their present autonomy if the result will be a vast improvement in the status of pharmacy both nationally and locally. If all were well with the profession, the *status quo* in our organization might be justified. Is there indeed anyone today who believes this to be so? To accomplish that which must be accomplished—and soon—requires some sacrifices by individuals, an effective organizational plan for pharmacy, a resolute program conceived with imagination and foresight, and vigorous action.

L. F. Tice

HISTOLOGICAL STUDIES OF THE GENUS LAVANDULA

Part I. Lavandula multifida L.

By J. K. Bhatnagar * and Marin S. Dunn **

Introduction

EARLIER histological studies of the members of the genus Lavandula have been restricted to a few well-known and commercially important species (1, 2). Most of the other species have either been studied casually (3) or neglected almost altogether. One such species is *L. multifida* L.

Though recognized as a distinct species for a long time, the plant has received little attention from other workers in the field. The plant described as *L. multifida* Burm (1768) is now considered to be *L. bipinnata Kuntze*, var. *intermedia* (4). Likewise, the name *L. pinnatifida* L. (Webb) is now considered to be a synonym for *L. multifida* L. Amongst the recent workers, Chaytor (4) made an extensive study of the morphological characteristics of the members of the genus including *L. multifida*. Sauvage (5) proposed another variety of the species, namely, *L. multifida* var. *homotricha*. Garcia (6) determined the chromosome number while Berti and Escalanta (7) studied the cultivation of the plant along with that of the other species. No report dealing with the microscopic investigation of this plant is currently available. In this paper, a concise description of the salient histological characteristics of the various organs, except the root, of *L. multifida* L. is given.

Material and Method

The material for the present study was obtained from the sources shown in Table I. The identity of each specimen was rechecked locally by comparison with the description of the species given by Chaytor (4) and others (8).

* Instructor in Pharmacognosy, Department of Biology, Philadelphia College of Pharmacy and Science, Philadelphia.

** Professor of Biology and Director of the Department of Biology, Philadelphia College of Pharmacy and Science, Philadelphia.

TABLE I*

SOURCES OF MATERIAL USED IN THE STUDY

Serial No.	*Specimen*	*Source*	*Collector*	*Place*	*Date*
1	dried	Herbarium, Philadelphia College of Pharmacy & Science, Philadelphia	Munby (Martindale Herbarium)	Oran	1851
2	dried	"	Rugel (Martindale Herbarium)	Tunis	Not known
3	seedling	Drug Plant Gardens and Laboratories, College of Pharmacy, University of Washington, Seattle 5, Wash., U. S. A.	Naumann	Seattle	Dec., 1958
4	dried stems and leaves	"	"	"	"
5	flowering plants	"	"	"	Aug., 1959
6	dried	Herbarium, Academy of Natural Sciences, Philadelphia.	Sennen and Jeronins	Sierra de Cano	—
7	dried	Instituto de Botanico, "Dr. Goncalo Sampaio" Universidade de Porto, Portugal.	G. Costa	Jardim Botanico	Feb., 1958
8	dried	Staatsherbarium, München, Germany.	W. Schimper	Algiers	1832
9	dried	Herbarium, Museum National d'Histoire Naturelle, Laboratoire de Phanerogamie, Paris.	E. Bourgean	Cartagena	April 29, 1851
10	dried	Washington U. S. National Museum, Department of Botany, Smithsonian Institution, Washington, D. C.	Not known	Malaga	Not known
11	dried	The Royal Botanic Gardens, Kew, Richmond, Surrey, England.	Not known	Setuval	1828
12	dried	"	E. Bourgean	Malaga	April, 1850
13	dried	"	W. C. Trevelyn	Setuval	Aug., 1876

* The authors wish to express their thanks for the valuable help received from Dr. T. P. Hass (Phila. Coll. Pharm. Sc.); Prof. A. Auberville (Museum, National d'Histoire Naturelle, Paris); Prof. Giuseppe Catalano (Univ. of Naples); Dr. A. Rozeira (Univ. of Porto); Dr. J. Cuatrecasar (Smithsonian Institution, Washington, D. C.); Dr. W. R. Naumann (Coll. of Pharm., Univ. of Washington, Seattle, Wash.); Curator, Academy of Natural Sciences, Philadelphia; Curator, Royal Botanic Gardens, Kew; and Miss Edna K. Neugbaur, Pasadena, California, U. S. A.

For microscopic studies, the dried material consisting of whole or broken leaves and flower parts, and fragments of stem, was treated with strong solution of chloral hydrate (50 gm./50 ml.) for different lengths of time depending upon the clearance of tissues required. For highly pigmented fragments, slight warming of the solution was sometimes necessary. Surface characteristics of leaves and the stem were studied either from whole mounts, or after removal of outer layers by carefully peeling under the compound dissecting microscope. Transverse sections of leaves and the stem were prepared by paraffin embedding followed by microtomy, or by free hand sectioning. The sections were stained differentially by a combination of safranin (1% w/v in 70% alcohol) and fast green (0.1% w/v in clove oil). Microchemical tests for the chemical nature of cell walls and cellular contents were performed on fresh unfixed material by the usual methods (9, 10). Maceration of the tissues was done with potassium chlorate-nitric acid mixture, and also with 10% solution of potassium hydroxide.

Outline drawings of large, opaque objects such as the nutlets and whole leaves were made by means of the Spencer Delineascope, Model B (Plate I). The object was placed on a slide on which an

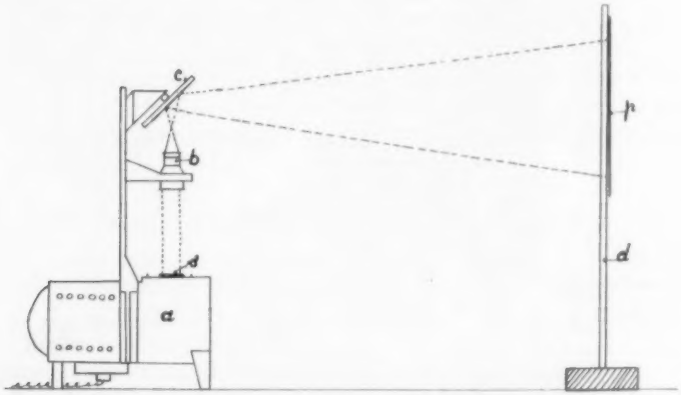


PLATE I

Arrangement to show the use of the Spencer Delineascope for making outline drawings, a, Spencer's Delineascope Model B; b, Focusing lens; c, Reflecting mirror; d, Glass plate; p, Drawing paper; s, Specimen.

accurately measured 1-cm.-long line was drawn with black, waterproof drawing ink. The image of the object and the black line were projected on a white sheet of paper held against a vertically-placed, transparent glass screen as shown in Plate I. The size of the image was controlled by adjusting the distance between the projector and the glass screen, and its approximate magnification determined by comparison with the length of the image of the line on the slide. All other drawings were made with the help of the camera lucida. Cellular dimensions were measured by means of the standardized ocular micrometer. As the data dealing with the dimensional differences of the various tissues in different species will be presented later in this report, only the more significant measurements for *L. multifida* are given in Table II.

Powder of the whole plant, excluding the root, was studied by the usual methods in order to note diagnostic histologic features of the species for subsequent identification and detection in a mixture of the powders of other Lavender species.

Macromorphological characteristics of the species have been described in detail and the same will not be repeated here.

TABLE II

IMPORTANT TISSUE MEASUREMENTS

Stem	Large nonbranching nonglandular hairs	Length 0.94-1.7 mm. to 1.8-2.2 mm.
	Branching hairs	up to 280 μ high
Leaf	Branching hairs	252 μ to 632 μ high
	Small glandular hairs	Stalk, 26 μ to 33 μ; Head, 20 μ to 30 μ
	Large glandular hairs	Stalk, 148 μ to 156 μ; Head 66 μ to 74 μ
Bract	Number of veins	3.
Calyx	Number of veins	15.
Pollen grains		41 μ to 49 μ.
Nutlet		up to 2 mm. long, 1.0-1.2 mm. broad, 0.75 mm. thick.

Microscopic Characteristics of Lavandula multifida L.

Stem

The stem of *L. multifida* shows a typical four-sided outline with prominent ridges, one at each of the four corners (Plate II, Figs. 2, 3). In the region of the ridge, the tissues are arranged as follows: the outermost epidermis covered with stratified cuticle; a narrow zone of thin-walled collenchymatous cortex without any distinct endodermis; a roughly semicircular zone of compactly arranged, lignified pericyclic fibers, constituting the bulk of the ridge; a narrow, often compressed and distorted parenchymatous phloem; and a well-developed xylem consisting of radially arranged rows of large tracheal elements, the rows being separated from each other by smaller, thick-walled lignified xylem parenchyma (Plate II, Fig. 4).

In surface view, the epidermal cells of the ridge are narrow and elongated and show few branching nonglandular hairs but rarely any stomata (Plate II, Fig. 6). However, on the sides of the stem, the epidermal cells are mostly irregularly polygonal, many of which are modified into (a) small whitish-gray branching hairs covering most of the external surface, and (b) less numerous but much larger, 10-12, sometimes up to 15-celled, uniseriate nonglandular hairs which are visible with the naked eye (Plate II, Figs. 5, 7). These large hairs are characteristic of the species. A few caryophyllaceous stomata are also seen but these are mostly covered over by the smaller branching hairs. The walls of the cells constituting the nonglandular hairs are covered by cuticle which shows numerous small, dot-like deposits of cutin which dissolve on treatment with warm 20% solution of potassium hydroxide. The walls of the epidermal cells, as also those of hairs, are mainly cellulosic as shown by the development of blue color on treatment with iodine solution followed by concentrated sulfuric acid. The cuticle covering the epidermal cells surrounding or constituting the basal cell of the hair is distinctly striated.

The pericyclic fibers vary considerably in their lengths and in the thickness of their walls. Except for a few isolated elements, the pericyclic fibers are generally absent from the flat sides of the stem. On these sides, the cortex and the phloem tissues are almost indistinguishable and the xylem is very poorly developed, especially in the young stems.

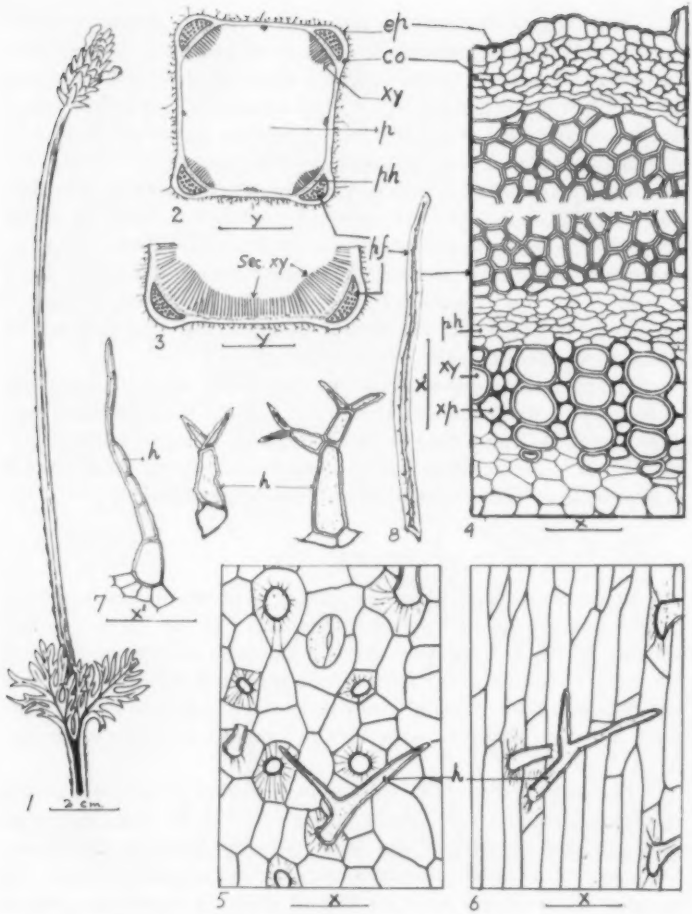


PLATE II

Lavandula multifida L. Figs. 1-8. 1, Flowering shoot; 2, Transverse section of a young shoot; 3, Portion of a transverse section of older stem; 4, Details of the transverse section of the young stem passing through the region of the ridge; 5, Surface view of the stem epidermis of the straight sides; 6, The same at the region of the ridge; 7, Nonglandular hairs, branching and nonbranching type; 8, Pericyclic fiber after maceration.

co, cortex; ep, epidermis; h, nonglandular hair; p, pith; pf, pericyclic fiber; ph, phloem; xp, xylem parenchyma; xy, xylem vessel.

Magnification $y = 500\ \mu$, $x' = 200\ \mu$, $x = 40\ \mu$.

The tracheal elements of the xylem bundles appear roughly circular in transverse outline and show great variations in their size, thickness of the walls, in the irregular shapes of their end walls and the pitting of the lateral walls. In older stems, the four larger xylem bundles opposite the ridges are joined together due to the formation of secondary xylem tissues on the sides of the stem (Plate II, Fig. 3), resulting in a continuous xylary ring around the central, parenchymatous pith. The secondary xylem is mostly composed of radial rows of lignified xylem fibers which, in transverse section, appear rectangular to oval in outlines. The lignification of these xylem fibers is neither uniform nor always complete. The secondary phloem is irregularly developed on the outside of the xylem ring and can be easily demarcated from the adjacent tissues.

The cells in the center of the pith are mostly cellulosic, but those lying toward the peripheral layers are slightly thickened and partially lignified. These marginal cells of the pith may be easily differentiated from the adjacent xylary elements because of their circular to oval outlines and comparatively much less lignification.

Foliage Leaf

Leaves show great variations in size and both the small and the large leaves are found together (Plate III, Fig. 9). The terminal portions of the leaf segments show a characteristic arrangement of the veins (Plate III, Fig. 10). The central and the marginal veins and their branches converge towards the tip where they form a large patch of xylary elements, some of which extend up to the epidermal layer.

The transverse outline from the basal region of the fresh petiole corresponds roughly to a square (Plate III, Fig. 11) but, in case of dried, pressed specimens, the shape is very much distorted and irregular. The lower, dorsal corners of the squarish petiole are rounded off while the inner or ventral ones are extended upwards or outwards. A large conducting zone occupies the center of the petiole. Phloem lies dorsally to the xylem with few pericyclic fibers lying on the outer peripheral region of the phloem. The constituent cells of the vascular bundle resemble cells of the similar tissue of the stem, except that these cells are smaller and narrower. The vascular bundle is surrounded by the parenchymatous cells with mostly circular

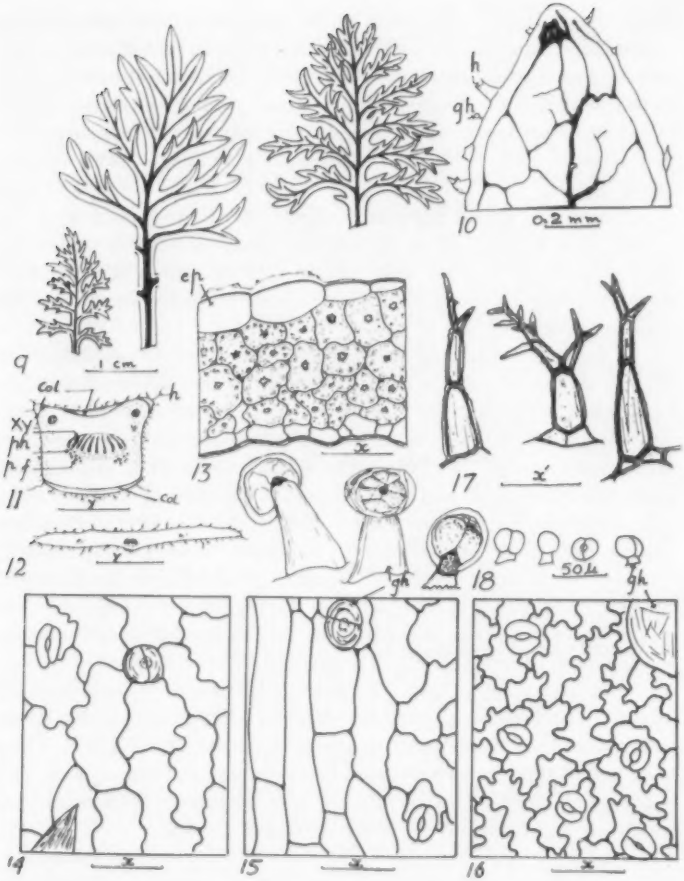


PLATE III

Lavandula multifida L. Figs. 9-18. 9, Small and large foliage leaves; 10, Terminal portion of the leaf segment showing venation; 11, Transverse section of the petiole in outline; 12, Transverse section of the leaf segment; 13, Details of the transverse section of the leaf segment; 14, Surface view of upper epidermis of leaf; 15, Lower epidermis of the leaf in the region of the veins; 16, Lower epidermis of the leaf; 17, Branching nonglandular hairs; 18, Large and small glandular hairs of the leaf.

col, collenchyma; ep, epidermis; gh, glandular hairs; h, nonglandular hair; pf, pericyclic fiber; ph, phloem; xy, xylem vessel.

Magnification x' = 200 μ, x = 40 μ.

transverse outlines. However, these parenchymatous cells become somewhat rectangular in outlines on the straight lateral sides of the petiole, and contain abundant chlorophyll and small cluster crystals of calcium oxalate. Two smaller vascular strands consisting mostly of xylary elements are seen amongst these chlorophyll containing cells, one opposite each of the two outwardly extending ventral corners of the petiole.

The entire dorsal peripheral region, the central portion of the ventral side, and the tip of the angular extensions of the petiole are made of collenchymatous cells (Plate III, 11, col) which are covered externally by an epidermis that resembles the epidermis of the stem in its details.

Transverse section of the segment of the leaf (Plate III, Figs. 12, 13) shows the various tissues arranged in the fashion of a dorsoventral leaf except that the palisade cells in this case do not materially differ from the cells of the mesophyll which are without prominent intercellular spaces. Both the palisade and the mesophyll cells contain abundant chlorophyll and cluster crystals of calcium oxalate. The two epidermis are almost similar except the lower epidermis has smaller cells with predominantly undulated walls (surface view), and also has a larger number of stomata (Plate III, Figs. 14, upper epidermis; 16, lower epidermis). In the region of the vein, the cells of the lower epidermis are narrower and elongated, as seen in the surface view (Plate III, Fig. 15, left half).

The large nonglandular cells seen on the stem are absent from the leaves. The branching hairs are common and are generally larger and stouter than those found on the stem (Plate III, Fig. 17). The basal cell of these branching hairs is the largest and the stoutest, and is frequently seen to rest at the top of a number of epidermial cells which are slightly raised above the surface of the leaf.

Besides the nonglandular hairs, there are observed on the leaves: (a) many small, glandular hairs with a short, single-celled stalk and a two-celled, globular head which is devoid of pigment, and (b) less numerous but very characteristic glandular hairs with a prominent eight-celled, highly pigmented, globular head joined by means of a densely colored peg-like neck cell with a much larger, colorless, one-celled stalk (Plate III, Fig. 18). The stalk cell is very broad at the base but narrows down near its upper end to fit in with the neck cell. The large glandular hairs are more frequent on the surface

of the leaf segment; whereas, the smaller cells are more often seen on the marginal areas. The cuticle covering the epidermal cells is continuous over these glandular hairs.

Bract

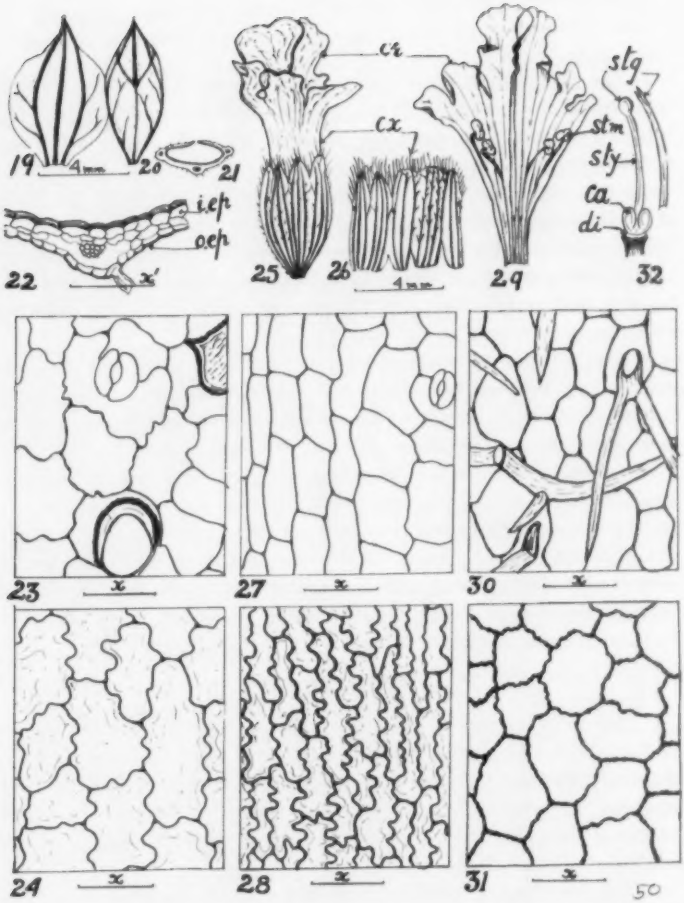
The yellowish-brown to brown bract is formed into an incomplete tube due to the folding of its margins towards the ventral side. The tube, thus formed, is narrower towards its ends but is wide and dorsally expanded in the middle region. Of the three dark-colored veins that run from the base to the sharply pointed tip of the bract, the central one is the largest and somewhat arched dorsally. This vein remains unbranched throughout its length. However, the smaller lateral veins, which lie closer to the points where the margins fold inwards (Plate IV, Figs. 20-21), give off small ascending branches from their outer margins (Plates IV, Fig. 19).

The veins are composed of fiber tracheids only and are surrounded by thin-walled parenchyma. The epidermis on the dorsal side of the bract is similar to the epidermis of the leaf except that its cells show fewer undulations in their outlines (Plate IV, Fig. 23). Nonglandular hairs of the branching type are very few in number. Stomata are also not numerous. The inner or the ventral epidermis, however, is very characteristic. Not only this epidermis is completely devoid of hairs of all types, but its cells also show highly thickened, suberized outer tangential walls. The thickness of the outer tangential walls is uniform and deep, and the radial walls are scarcely visible even on varying the focus (Plate IV, Fig 22, i.ep; Fig. 24).

Calyx

The relative sizes of the calyx and the corolla tubes are shown in Fig. 25 of Plate IV. The calyx tube, cut open and viewed from the outer surface, shows fifteen prominent veins composed of fiber tracheids (Plate IV, Fig. 26). These veins run through the entire length of the calyx tube and end as such or after branching, in the bilobed margin of the tube.

The veins in the material examined give off branches in a characteristic fashion. The smaller of the two marginal lobes of the calyx tube contains six veins arranged into two groups of three veins each, and end in the two, pointed segments of the lobe (Plate IV, Fig. 26 left). The central of these three veins in either group remains


19
4mm
20
21
22
x'
icp
ocp
25
cr
cx
26
4mm
29
32
stg
stm
sty
ca
di
23
x
27
x
30
x
24
x
28
x
31
x

50

unbranched throughout, while the lateral ones give off small branches from their outer sides only. Some of these branches subsequently join together. The larger lobe of the calyx tube contains nine veins, of which only the central three give off branches from either side and form a fine network near the upper margin. The remaining six veins, three on either side of the central ones, branch off in a manner similar to that seen in the smaller lobe (Plate IV, Fig. 26 right).

Numerous hairs cover the outer surface, especially in the region of the veins and the margin of the calyx tube. These hairs are thin, multicellular, uniseriate, and nonglandular, the hairs on the margin being comparatively much larger in size. The outer epidermis between the veins often show areas which are free of hairs (Plate IV, Fig. 27). The epidermal cells are more or less polygonal with straight sides, except in the region of the veins where these cells become narrower, rectangular, and arranged axially. The inner epidermis is similar to the inner epidermis of the bract except that the cells here are narrower with wavier walls (Plate IV, Fig. 28).

Corolla

The corolla tube, when cut open and spread with its inner surface facing upwards (Plate IV, Fig. 29), shows a narrow basal region, a gradually widening middle portion, and an expanding bilobed margin.

The epidermal cells in the basal region of the tube are very much distorted in outline, with thick, suberized walls. However, in the

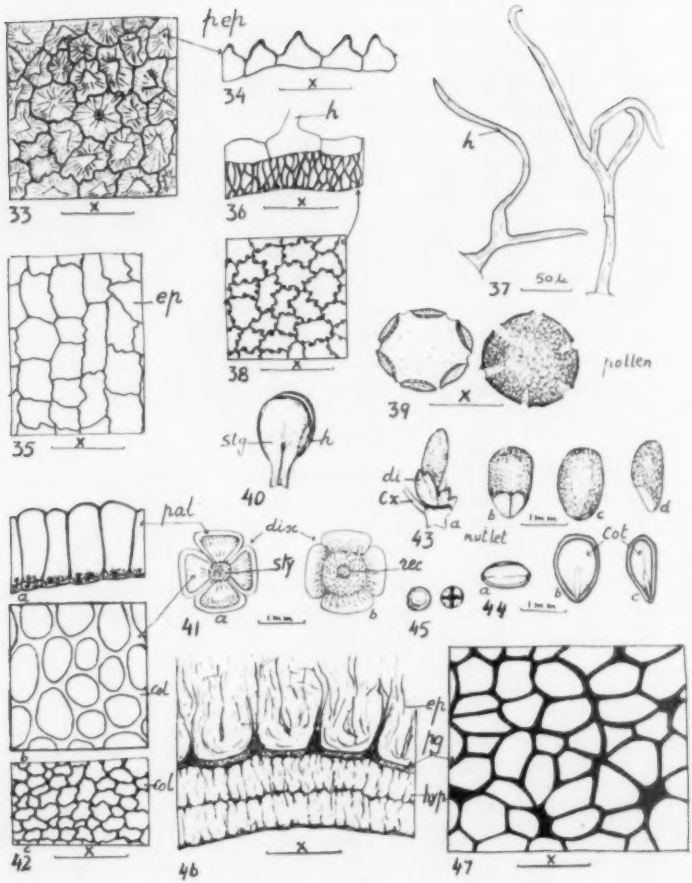
---

PLATE IV

Lavandula multifida L. Figs. 19-32. 19, The bract as seen from outerside after spreading out; 20, The bract with its margins folded as seen from the inner side; 21, Diagrammatic transverse section from the middle region of the bract; 22, Details of the same; 23, Bract epidermis, lower or outer surface; 24, Bract epidermis, upper or inner surface; 25, Sketch of a flower; 26, The calyx tube cut open and spread out with its outer surface facing up to show the arrangement of the veins; 27, Calyx epidermis, outer surface view; 28, Calyx epidermis, inner surface view; 29, Corolla tube, cut open and spread out to show the insertion of the anther filament; 30, Corolla epidermis inner surface near the point of insertion of the stamen filament; 31 Corolla epidermis, inner surface, in the expanding region of the corolla tube; 32, the ovary, style, and stigma.

ca, carpel; cr, corolla; cx, calyx; di, disc; i.ep, inner epidermis; o.ep, outer epidermis; stg, stigma; sty, style.

Magnification y = 500 μ, x' = 200 μ, x = 40 μ.


33
34
36
37
38
39
40
41
42
43
44
45
46
47
ep
h
pollen
sty
pal
dix
rec
col
hyp
nutlet
cot

middle region, numerous downwardly directed multicellular hairs are seen, particularly near the points of emergence of the stamen filaments. These hairs are seen on both the inner and the outer surfaces, and are smaller and more delicate than the nonglandular hairs found elsewhere on the calyx and the leaf. No glandular hairs were seen in this region. These hairs gradually disappear as the corolla tube continues to widen in the upper regions (Plate IV, Figs. 30, 31). The epidermal cells in this portion also become slightly larger and show irregularly thickened walls.

In the upper expanded portion of the corolla tube, the epidermal cells on either surface, are small and typically papillose (Plate V, Figs. 33, 34). In the extreme marginal areas, the parenchymatous layers separating the two epidermis disappear so that these two layers come to lie next to each other.

Stamen, Style, and Stigma

The lengths of the stamen filaments vary in the same and in different flowers although their structure is essentially similar. The

---

←

PLATE V

Lavandula multifida L. Figs. 33-47. 33, The papillose epidermis of the corolla lobe, surface view; 34, The same in side view; 35, Filament epidermis, surface view; 36, Transverse section of the anther lobe wall; 37, Epidermal hairs of the anther lobes; 38, Surface view of the inner layer of the wall of the anther lobe; 39, Pollen grains; 40, Diagrammatic view of the stigma showing the hairy cushion on one of the sides; 41 a, Fully developed nectary disc as seen from the top; 41 b, The same as seen from below; 42 a, The margin of the lobe of the disc as seen from above; b and c, The surface view of the lobe at the middle and lower regions respectively, as viewed from the inner surface; 43 a, The nutlet and its relation to the nectary disc; b, Nutlet, the outer convex surface; c, The inner flat surface; and d, The side view; 44, Nutlet, a, The transverse section; b, Longitudinal section through the wider axis; and c, The longitudinal section through the narrower axis; 45, Inert bodies as seen without and with the polarised light; 46, Transverse section of the nutlet wall showing the outer epidermal layer on treatment with water, and the inner one-layered hypodermis; 47, The basal pigmented and suberized portion of the radial walls of the epidermal cells as seen in surface view after the removal of the swollen portions.

col, collenchyma; cot, cotyledon; cx, calyx; di, disc; ep, epidermis; h, nonglandular hairs; hyc, hypocotyl; hyp, hypodermis; pal, palisade cells; p.ep, papillose epidermis; pg, pigmented epidermal cells; rec, receptacle; stg, stigma; sty, style.

Magnification x = 40 μ.

central, narrow vascular strand is surrounded by two or more layers of small, elongated parenchyma, which in turn is covered externally by the epidermis consisting of small, rectangular, axially arranged, suberized cells (Plate V, Fig. 35).

The structure of the style is essentially similar to that of the filaments except that there are two vascular strands running throughout the length of the style. These strands ultimately ramify and end, one in each of the two discoid lobes of the bifid stigma (Plate IV, Fig. 32, stg).

The walls of the mature anther lobes are made of two layers of cells, and enclose within numerous typically 6-colpate pollen grains at various stages of development (Plate V, Fig. 39). The outer of the two layers constituting the walls of the lobes is made of small, thin-walled epidermal cells many of which are transformed into thin, elongated, colorless, nonglandular branching hairs (Plate V, Fig. 36 and Fig. 37, h). These hairs are soft, delicate, and interwined, and are found all over the surface of the anther lobe. The cells constituting the inner layer of the lobe wall are very characteristic, and show numerous irregularly arranged strands of thickenings on their radial walls (Plate V, Fig. 36) which when viewed from above show typical beaded appearance (Plate V, Fig. 38).

The discoid lobes of the stigma are covered with papillose epidermis over most of the surface, except for a small area on one side where a small hairy cushion-like structure is seen (Plate V, Fig. 40, h).

Ovary Disc and the Nutlets

When fully developed, the nutlets are found enclosed within the calyx tube. The nutlets often cohere to each other and lie on a well-developed ovary (nectary) disc (Plate V, Fig. 43, di) which appear as a shallow cup-like structure with its margins divided into four distinct lobes. When viewed from the top, the disc appears as a cross-shaped structure (Plate V, Fig. 41 a) with a circular, dome-shaped mass of pigmented cells occupying the center of the cross. The central pigmented tissues probably represent the base of the fallen style.

When viewed from the underside (Plate V, Fig. 41 b), the disc is seen to be made up of two distinct zones. The inner rounded zone consists of circular rows of tangentially elongated cells arranged

around a highly pigmented center which represents a portion of the receptacle. The outer zone is composed of radially elongated cells which form the under surface of the disc lobe.

At the free margins of the lobes, there appears a layer of large elongated, palisade-like cells often showing internally what appears to be a highly compressed, distorted and pigmented zone containing numerous, small, almost circular, inert bodies which assume a very distinctive crossed-shaped pattern when seen under polarized light (Plate V, Fig. 42 a, and Fig. 45). These inert bodies are not visibly affected by the ordinary laboratory reagents such as dilute hydrochloric acid, sulfuric acid, sodium hydroxide, and potassium hydroxide. Concentrated hydrochloric acid gradually dissolves them. Organic solvents such as acetone, ether, and alcohol, and reagents such as Sudan III and Million's produce no visible effects. They are not stained by iodine solution. Additional investigation of the chemical nature of these bodies will be undertaken.

The lobes are more than one cell thick at the basal region. When seen from the inside, the cells constituting the lobe appear to be collenchymatous. In the middle region, these cells are larger and thicker than those present at the base of the lobe (Plate V, Fig. 42 b, c).

Frequently, one or more of the disc lobes fail to develop. In such cases, the corresponding nutlet was also found to be absent. The nutlets are small up to 1.5 mm. long to 1 mm. broad, and nearly half as thick as broad at the middle region. One surface of the nutlet is almost flat, while the other is convex and raised in the middle along the longer axis. There is present a white triangular area on the pointed end of the nutlet on its convex side. This white area is divided into two sections by a small colored ridge. The rest of the surface of the nutlet is brown to dark-brown and is marked with minute irregular pits. Also seen on the surface are fragments of white cellular tissue which readily swell when brought into contact with water. The interior of the nutlet is almost completely occupied by the seed (Plate V, Fig. 44 a, b, c).

Transverse section through the wall of the middle region of the nutlet shows a very characteristic epidermis whose outer tangential and parts of the radial walls swell greatly after contact with water, as mentioned above, forming numerous colorless, hair-like extensions. These extensions on treatment with iodine solution followed by con-

centrated sulfuric acid produce deep blue color. Blue color is also taken up by these after remaining in contact for some time with methylene blue. Addition of concentrated sulfuric acid causes these extensions to contract and finally disappear due to dissolution.

The inner pigmented tangential walls, as also the basal portions of the radial walls, are not affected by water. In surface view, after the removal of the outer swollen parts, these pigmented remnants of the epidermal cells appear to be very irregular in outlines (Plate V, Fig. 47) with excessive deposit of the pigment at the junction of some of the cells. These walls give the reaction for suberin (not dissolving in concentrated sulfuric acid).

Beneath the epidermis of the nutlet wall is present a layer of radially elongated, highly thickened, lignified cells (Plate V, Fig. 46 and Plate VI, Fig. 48) showing in surface view greatly undulated walls (Plate VI, Fig. 49), which are traversed by minute pore channels. The lumina of these cells are small and may be connected with those of the adjoining cells by means of the pore channels. Towards the pointed end of the nutlet, the size of the cells and the thickness of the cell walls are gradually reduced.

Enclosed within the nutlet wall, but distinctly separate from it, lies the seed covered with a two-layered seed coat. The yellowish-brown cells of the outer layer are irregular in outline when seen in surface view, and show numerous small perforations on their walls. The cells of the inner layer of the seed coat are hyaline, thicker-walled, non-perforated, and very variable in size (Plate VI, Fig. 50). Towards the pointed end of the nutlet, the seed coat is also formed into a small protuberance in which rests the radicle. On the flat side of the seed coat is seen a characteristic light-colored area surrounded by many rows of small pigmented cells (Plate VI, Fig. 53 a).

The two cotyledons are thick, plano-covex, and notched halfway to the middle, with the embryonic axis lying in the notch. The cotyledons are made of small, compactly-arranged polygonal epidermal cells which appear square to rectangular in transverse section, and a few layers of compactly-arranged polygonal cells of subepidermal tissue containing abundant oily reserve food material (Plate VI, Figs. 51, 52). However, the subepidermal tissue on the inner flat surface of cotyledon contains elongated cells which resemble the ordinary palisade cells of the leaf (Plate VI, Fig. 52 pal).

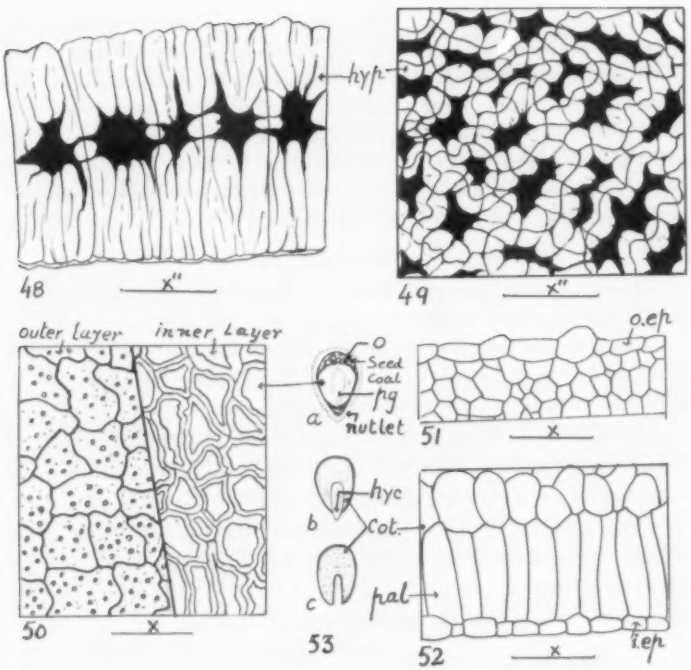


PLATE VI

Lavandula multifida L. Figs. 48-53. 48, Transverse view of the hypodermis cells; 49, Surface view of the hypodermis cells; 50, The seed coat, surface view; 51, Transverse section of the cotyledon showing the outer epidermis; 52, The same showing the inner epidermis and the subepidermal palisade cells; 53 a, The seed coat with the cotyledons removed, to show both the inner surface with the pigmented area, pg, and also a part of the outer surface at o; b, the embryo; and c, The cotyledons with embryo axis removed to show the notch.

cot, cotyledon; hyc, hypocotyl; hyp, hypodermis; i.ep, inner epidermis; o.ep, outer epidermis; pal, palisade.

Magnification x = 40 μ, x'' = 20 μ.

Diagnostic Characteristics of the Powder

The important histological features helpful in the detection of the plant in a powder of its aerial parts are: the large, nonbranching hairs of the stem, either whole or in broken state; branching hairs of the stem and the leaves; large glandular hairs of the leaves; inner epidermis of bract, and the calyx tube; papillose epidermis of the corolla tube; pollen grains; fragments of the nutlet walls, if present; cluster crystals of calcium oxalate; and other lignified elements such as pericyclic fibers and the tracheal tissue.

Summary

In this report, salient histological features of *Lavandula multifida* L. are described briefly and illustrated.

Surface and internal characteristics of the stem, the leaf, the bract, flower parts including calyx, corolla, stamen, style, and stigma, and the nutlet are described and illustrated.

Diagnostic histological features of the powder of the aerial parts are noted and important tissue measurement given in tabular form.

Acknowledgment

The authors are happy to acknowledge their indebtedness to the Kilmer Fund of the Philadelphia College of Pharmacy & Science for financial assistance.

REFERENCES

(1) Oztig, F., Lavandula stoechas L. und L. cariensis Boisser. Eine vergleichend morphologisch-anatomische Untersuchung zweir Charakterpflanzen der türkischen Macchie, Rev. Fac. Sci. Univ. Istanbul Ser. B. Sci. Nat., *10(4):* 251-282, 1945.

(2) Mäckel, H. G., Zur Mikroskopie einiger weniger bekannter Lavendel-Blattdrogen, Bot. Oeconomica, *1:*129-141, 1948.

(3) Hegi, G., Illustrierte Flora von Mitteleuropa, V. Band, 4. Teil, J. F. Lehmanns Verlag, München, p. 2276.

(4) Chaytor, D. A., a taxonomic study of the genus Lavandula, J. Linn. Soc., *51:*153-204, 1937.

(5) Sauvage, Charles, Annotation au Catalogue des plantes du Maroc. (Fescicule 2), Bull. Soc. Sci. Nat. Maroc., *35/37:*351-402, 1945/1947.

(6) Garcia, J. G., Contribucao para o estudo cariostematico do genero Lavandula, Bull. Soc. Broteriano, *16:2*ª ser., 183-193, 1942.

(7) Berti, Humberto, and Manuel G. Escalanta, La Lavandas cultivadas en la Argentina, Bull. Soc. Argentina Hort., *5(49):*17-23, 1943.

(8) Bailey, L. H., The Standard Cyclopedia of Horticulture, vol. IV, The Macmillan Company, New York, 1922, p. 1829.

(9) Johansen, D. A., The Plant Microtechnique, McGraw-Hill Book Company, New York, 1940, pp. 126-154.

(10) Trease, G. E., A Text Book of Pharmacognosy, 7th ed., Williams and Wilkins Company, Baltimore, 1957, pp. 736-749.

1960 ANNUAL MEETING (PLANT SCIENCE SEMINAR) OF THE AMERICAN SOCIETY OF PHARMACOGNOSY

THE University of Colorado College of Pharmacy was host to the First Annual Meeting (Plant Science Seminar) of the American Society of Pharmacognosy from June 30 to July 2, 1960. The program committee included the following:

Dr. Maurice C. Andries, *Chairman*

Dr. Melvin R. Gibson

Dr. Frank L. Mercer

The members were welcomed by Dean Curtis H. Waldon of the School of Pharmacy at the University of Colorado.

The Seminar activities included a field trip to the Rocky Mountain National Park. Dr. John W. Marr of the Institute of Arctic and Alpine Research of the University of Colorado gave an interesting lecture on the biological projects they are undertaking in these areas. Papers dealing with research and teaching in pharmacognosy were presented, including—

1. "A Phytochemical Study of *Vinca major L.*", by Dr. N. R. Farnsworth, Pittsburgh University.
2. "Metabolic and Morphological Changes Induced by Gibberellic Acid on *Mentha piperita*" by Dr. G. Gerstad of Wayne State University.
3. "Studies on The Fate of Hyoscyamine in *Atropa* Belladonna", by Dr. E. S. Mika, Chicago University.
4. "Histological Studies of the Genus Lavandula", by Dr. M. S. Dunn of Philadelphia College of Pharmacy and Science.
5. "Gibberellin Effects on the Carbohydrate, Glycoside, and Growth Patterns in *Digitalis lanata* Ehrhart", by Dr. L. A. Sciuchetti of Oregon State College.

The present officers of the Society are:

Varro E. Tyler, Jr., *President*

Norman F. Farnsworth, *Vice-President*

Rolf S. Westby, *Secretary*

Frank A. Crane, *Treasurer*

Edward P. Claus, *Executive Committee*

Carl H. Johnson, *Executive Committee*

David P. Carew, *Executive Committee*

This Society has been formed by the pharmacognosists of the United States to formalize and perpetuate the standards and ideals of the Plant Science Seminar and has for its purpose ". . . to promote the growth and development of pharmacognosy, to provide the opportunity for association among the workers in that science and in related sciences, to provide opportunities for presentations of research achievements and to promote the publication of meritorious research." Membership is also open to graduate students and workers of other nations.

BOOK REVIEWS

Biophysical Science: A Study Program. J. L. Oncely, Ed. viii + 568 pp. John Wiley and Sons, Inc., New York 16, N. Y., 1959. Price: $6.50.

Recent researches on the mechanisms and reactions of living things, which differentiate the living from the inanimate, have produced an increasing awareness of the necessity for an interdisciplinary approach to this problem.

To provide an introduction to the value of combining physical and chemical methodology in the investigation of biological problems, a conference on Biophysical Science was held under the auspices of the National Institute of Health. The results of this symposium were published simultaneously in this book and in the *Review of Modern Physics*. This dual dissemination was part of an effort to provide a large heterogeneous group of scientists with this important compilation of new concepts. Over 120 senior research scientists and numerous selected younger contributors participated in this exchange of information and ideas.

The editors of this publication organized the papers given at the conference into related categories to give a progressive development of the knowledge of a particular subject from the historic fundamentals to the most recently developed concepts. The structural arrangement of the information resulted in the construction of a framework of reference on which future investigations can be planned.

Throughout the book, the physical and biological sciences are integrated in an understandable yet subtle fashion. Advanced mathematical, chemical, and physical methods for the solution of biological problems are employed in a manner that they are clear to the neophyte in the scientific disciplines.

The introductory chapters are concerned with molecular physiological processes and gradually develop into a treatment of the physiochemical properties and behavior of fats, carbohydrates, and proteins. Macromolecules are also considered in detail. This discussion is followed by an explanation of enzyme systems, energy exchange and transformation, biosynthesis and related phenomena. The

next section is devoted to the genetics of cellular activity, coding replication, mutation and aspects of radiobiology. The neuromuscular system is the center of interest in the remaining chapters, since an appreciable amount of information is available on the use of physical methods for the study of connective tissues. The study program concludes with a demonstration of some homeostatic mechanisms of living things.

The information contained in this volume requires careful and concentrated psychic digestion. A full appreciation of the significance and importance of this coordinated interdisciplinary approach to the problems of life is essential for progressive scientific thinking and research. Everyone with an interest in things scientific can profit from the knowledge contained in these chapters. The book represents a major step toward the closer alliance of the biological and physical scientists for the mutual advantage of all concerned.

THOMAS H. F. SMITH

New and Non-Official Drugs 1959. Council of Drugs of the American Medical Association. xxvii + 687 pp. J. B. Lippincott Co., Philadelphia 5, Pa. Price: $3.35.

As an aid to the busy physician, the Council on Drugs of the American Medical Association publishes this annual compilation of essential information about new therapeutic agents which have been proposed for use in humans during the previous year.

The monographs included in each annual edition are prepared by expert consultants who base their comments upon an exacting and critical analysis of all clinical and laboratory information available to them. No actual testing procedures are performed by the evaluators of the council. Neither are any of the described products endorsed, recommended, or guaranteed.

All the preparations are arranged alphabetically in classes according to their pharmacological action. The proprietary name, structural formula, and physical properties are given. In addition, the mode of action, proposed use, indications dosage, and selected commercial preparations are described.

The value of this handy, concise handbook of data is increased by periodic revisions, supplements, and changes which appear in the A. M. A. Journal. The physician is thus afforded an unbiased, straightforward, and informative description of currently marketed new therapeutic agents.

Undeniably, the use of this book creates a more desirable impression than shuffling through manufacturer's index cards when seeking a product. This book is a useful and timely index which pharmacists and physicians should have within reach at all times.

THOMAS H. F. SMITH

Figures That Count: Mathematics for Nurses. M. J. Koch and J. B. Barbata. 127 pp. Littlefield, Adams & Co., Paterson, N. J., 1960. Price: $1.50.

This paperbound, inexpensive, and timely addition to a new series of Handbooks for Nurses presents a well organized review of mathematics of drugs and solutions.

The chapters of this book offer a progressively difficult sequence of exercises and word problems on the preparation of drugs and solutions and the calculation of dosages. By the use of patient-centered situations and the inclusion of an answer section, the nurse is given incentive to solve the problem correctly. This type of presentation also adds to the practical value of this book for nurses and nursing students.

One section of this book is devoted to the important topic of computing insulin dosages and the types of insulin syringes are reviewed. Another part discusses the procedures employed in diluting antibiotic agents when the dosage is to be given in units rather than milligrams.

For the nursing educator who is teaching medical and surgical nursing care or the hospital pharmacist who deals with nurses, this compact, pocket-size, and understandable handbook should prove a great aid in explaining calculation problems.

THOMAS H. F. SMITH

Fat Consumption and Coronary Disease: The Evolutionary Answer to the Problem. T. L. Cleave. 40 pp. Philosophical Library, New York City, N. Y., 1958. Price: $2.50.

Had the author of this monograph confined himself to an elucidation of medical and scientific evidence in support of his topic, rather than expostulations of a philosophical nature, his contribution might have proven more worthy. Instead, Dr. Cleave transgressed from a familiar discipline to one about which he apparently possessed only a restricted knowledge.

In his prefatory paragraphs, he bases his premise on atherosclerotic disease upon the Darwinian theory of evolutionary adaptation. He proposes that this be accepted as an irrefutable doctrine or natural law of adaptation. From this, he then implies that an organism can rely upon this principle with absolute confidence in making judgments of behavior. The fallaciousness of dependence upon a decision derived from a spurious starting proposition is incomprehensible. This supposition implies that certitude can be derived from mendacity, and that instinct is capable of domination over free choice by man. This concept is widely disputed.

If the reader can exercise sufficient discretion to sift the documented scientific "wheat" from the philosophical "chaff," the pages of this treatise contain a number of stimulating concepts relevant to dietary factors and coronary atherosclerotic disease.

While the attempts of the author to philosophize are criticized, his sagacity in providing two rules of diet are undeniably of value to all. He advises man to: 1) Eat foods in their natural state (simple cooking), and 2) To eat in strict proportion to the appetite; i.e., in moderation.

By firm adherence to these precautions, he suggests that atherosclerotic coronary disease can be greatly decreased in both incidence and severity. In general, this monograph is a thought-provoking bit of reading with a new slant given to an overworked subject.

THOMAS H. F. SMITH

American Journal of Pharmacy

The American Journal of Pharmacy is the oldest continuously published scientific periodical of its kind in America, having been established by the Philadelphia College of Pharmacy in 1825. After the original issue there were three other preliminary numbers until 1829, when regular publication began. From then until 1852 four issues were published annually, with the single exception of 1847, when an additional number appeared. Six issues a year were printed from 1853 to 1870, at which time the Journal became a monthly publication.

Former Editors of the Journal have been: Daniel B. Smith, 1825-1828; Benjamin Ellis, 1829-1831; Robert E. Griffith, 1831-1836; Joseph Carson, 1836-1850; William Procter, Jr., 1850-1871; John M. Maisch, 1871-1893; Henry Trimble, 1893-1898; Henry Kraemer, 1898-1917; George M. Beringer, 1917-1921, and Ivor Griffith, 1921-1941.

Established and maintained as a record of the progress of pharmacy and the allied sciences, the Journal's contents and policies are governed by an Editor and a Committee on Publications elected by the members of the College.

Manuscripts should be sent to the Editor, who does not assume any responsibility in connection with the views or investigations of contributors of accepted manuscripts, other than to exercise general care in selection.

Contributors are allowed a reasonable number of copies of this Journal, free of charge, if applied for when the proof is returned.

Reprints, if desired, should be ordered when the proof is returned. The table below shows the *approximate* cost of reprints, the make-up of the pages to be identically the same as in the Journal. The actual cost may vary from the figures given, and will depend upon the amount of presswork, paper, binding, and other factors. Reprints containing half-tones may be expected to cost somewhat more than the rates given.

	2 pp.	4 pp.	8 pp.	16 pp.	Covers with Titles
50 copies.....	$ 4.50	$10.00	$16.25	$27.50	50 copies..... $ 7.50
100 "	7.50	13.75	21.25	40.00	100 " 12.50
250 "	10.00	17.50	27.50	53.75	250 " 17.50
500 "	15.00	25.00	35.00	68.75	500 " 26.25